



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,299	07/14/2005	Kiminori Mizuuchi	10873.1727USWO	5274

53148 7590 11/07/2006

HAMRE, SCHUMANN, MUELLER & LARSON P.C.
P.O. BOX 2902-0902
MINNEAPOLIS, MN 55402

EXAMINER

PENG, CHARLIE YU

ART UNIT PAPER NUMBER

2883

DATE MAILED: 11/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/542,299	MIZUUCHI ET AL.	
	Examiner	Art Unit	
	Charlie Peng	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 11 and 12 is/are rejected.
- 7) ☒ Claim(s) 8-10 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/11/2005</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. 5,991,490 to Mizuuchi et al. in view of U.S. Patent 6,118,908 to Bischel et al. Mizuuchi teaches an optical wavelength conversion device having a LiTaO₃ crystal substrate 101 including a domain inverted layer 104 having period of Λ . (See at least Fig. 9 and corresponding description of Example 1.) Although the LiTaO₃ substrate is used as the substrate in Example 1, a similar device can also be fabricated by using MgO-doped, Nb-doped or Nd-doped LiTaO₃, LiNbO₃, a mixture thereof, i.e., LiTa_(1-x)Nb_xO₃ ($0 \leq x \leq 1$), and KTP (KTiOPO₄). Since LiTaO₃, LiNbO₃ and KTP each have a high nonlinearity, an optical wavelength conversion device with a high efficiency can be fabricated. Since a method for forming a domain-inverted layer has been established with these materials, an optical wavelength conversion device can advantageously be formed. (Column 22, lines 37-46)

Mizuuchi does not teach what the domain-inverted layer's refractive index relies on. Bischel teaches, referring to Fig. 2, a patterned poled dielectric device/an electrically-controllable stacked dielectric optical energy redirector, or, in a preferred embodiment, a bulk optical reflector in a ferroelectric crystal 20 of lithium niobate. (See

Art Unit: 2883

at least Fig. 2 and description.) Typically, a poling process is accomplished using an electric field. A grating 22 is formed or defined by the boundaries 34 between alternating domains of two different types. A first type of domain 36 has a different electro-optic (E-O) coefficient than a second type of domain 38, so that a uniform electric field applied by a voltage source 32 between electrodes 24 and 26 results in different changes in the index of refraction in the two types of domains. (See column 8, paragraph 1 and column 9, paragraph 2.) The strength and the center frequency of the grating are tuned simultaneously by applying a single voltage between the two electrodes of the device. The average refractive index of the grating changes with the applied electric field, causing a change in the center wavelength of the grating that is proportional to the electric field. (Column 27, paragraph 1.) The poled grating structure of our invention has two major advantages over the prior art. First, the poled domain structures can have very sharp boundaries, providing a strong Fourier coefficient at virtual photon momenta which are multiples of the momentum corresponding to the basic grating period. Second, strong index modulation gratings can be made even if the optical mode dimension is large compared to the grating period. (Column 11, lines 39-65.)

Since the Mizuuchi reference and the Bischel reference are from the same field of endeavor in domain inversion of lithium niobate optical devices, the purpose of using electrodes in the poling process would have been recognized in the pertinent art of Mizuuchi's invention. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the teachings of Mizuuchi by using the

Art Unit: 2883

poling process by ways of the electrode as disclosed by Bischel for the motivation of achieving the two major advantages stated above.

With specific reference to claims 3 and 4, referring to a further embodiment of Bischel illustrated in Fig. 9, the domain walls are preferably formed by electric field poling of a ferroelectric crystal which is cut at an angle to the z-axis 165. Since the electric field poled domains travel preferentially down the z axis, poling an angle-cut crystal by this technique results in domain boundaries parallel to the z axis, at the same angle to the surface. The angle 166 of the cut of the crystal is so that light propagating in the plane of the crystal may be reflected out of the substrate (any angle may be used). (Column 22, paragraph 1)

With specific reference to claims 5 and 6, Mizuuchi teaches, in Example 12, an optical wavelength conversion device having a ridge (convex) region 1207 with a domain inverted structure (1210), the ridge 1207 is attached to a LiTaO₃ substrate 1201 via an annealed proton-change layer 1206.

With specific reference to claims 11 and 12, Mizuuchi teaches, in Example 4, a short-wavelength light source includes a semiconductor laser 421 emitting light having a wavelength of 800 nm mounted onto a sub-mount 420 made of Si or the like and an optical wavelength conversion device 422. (Column 28, lines 4-18.) Further, Mizuuchi's invention relates to an optical waveguide used for optical information processing and applied optic measurement, which utilize a coherent light source, and a wavelength conversion device employing such an optical waveguide. (Field of Invention.)

Allowable Subject Matter

Claims 8-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. With reference to claims 8 and 9, Mizuuchi and Bischel teach the optical waveguide device with a domain inverted structure but not a specific range for a Bragg reflection wavelength that harmonizes with a phase matching wavelength in the structure. With reference to claim 10, U.S. PGPub 2001/0048705 to Kitaoka et al. teaches a wavelength-variable semiconductor laser having a DBR region 111 and a wavelength converting device 116 comprising a domain-inverted region 114, but the DBR region 111 is not part of the domain inverted region 114 as required by the claim. As there are no teachings or suggestions in the prior art to determine the value of the Bragg reflection wavelength or use an alternative structure as disclosed, it is the examiner's opinion that the prior art of record, taken alone or in combination, fails to disclose or render obvious the disclosed invention, in combination with the rest of the limitations of the base claim.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 11 October 2005 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement has been considered by the examiner.

Applicants and each individual associated with the filing and prosecution of this application are reminded of their duties to disclose all information known to be material to patentability under CFR 37 § 1.56.

Conclusion

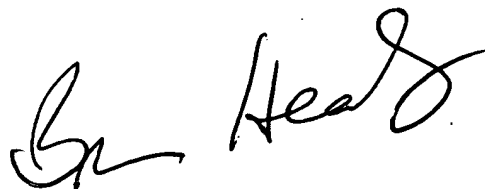
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Please see form PTO-892 for additional references.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charlie Peng whose telephone number is (571) 272-2177. The examiner can normally be reached on 9 am - 6 pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

cyp

A handwritten signature in black ink, appearing to read "Brian Healy". The signature is stylized with a large, looped "H" and a cursive "e".

Brian Healy
Primary Examiner